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Preschool education on protective behavior and practice against over-exposure to sun

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Abstract

Students of preschool education program were submitted to an up-graded informal Sun-safety education project. Statistically significant improvement was observed comparing their knowledge for pre- and post-education intervention regarding solar UV-radiation. Additional competences and some basic knowledge would enhance effective professional development and competences of future teachers, protecting children from UV exposure. It would promote initiatives for preventive measures in students as well, thereby reducing their risk for skin cancer too.

Keywords: Sun exposure; UV radiation; skin cancer; prevention; pre-school education.

1. Introduction

Over the next 50 years some thousands of extra skin cancers will be experienced as today's children grow up over-exposed to higher levels of solar ultraviolet (UV) radiation due to ozone depletion (EEA, 2004). Because of a thinner layer of ozone in the stratosphere, increased amount of the UV-B component (280-315 nm) reaches the Earth surface, having potentially severe consequences for human health. While certain exposure to the sun is necessary for the formation of vitamin D, an excessive exposure can cause immediate adverse effects like: sunburn, phototoxic reactions, photo-allergic reactions, erythema, etc. (Matsumura and Ananthaswamy, 2004) and severe late consequences such as skin cancers and eye cataract (Gallagher and Lee, 2006). As recently reported, overexposure to sun has also potential effects on immune suppression (Katiyar, 2007). The International Agency for Research on Cancer, IARC, has classified solar radiation as an environmental human carcinogen and placed it into Group 1 (IARC, 1992).

Skin cancers are associated with intense, sporadic sun exposure (sunburns) as well as chronic sun exposure (tanning) (CDC, 2002). Repeated and severe sunburns in childhood have a major role in the development of skin cancer later in life. Individual's sun-exposure history before age of 20 years appears to be a significant risk factor (CDC, 2002). In recent decades the incidence of skin cancers doubled each 6-10 years in fairer skinned populations

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(Norval *et al*., 2007). The incidence is reported to be high worldwide (AIHW, 2008; USCS, 2007) and it is on the first to second place among all types of malignancies since 2003 in Slovenia (OI CR, 2009).

It has been estimated that 90% of all skin cancers are preventable (CDC*,* 2002), so preventive behaviour could be a key controlling factor. Several authors reported that continuous education of age-specific target groups resulted in changes in the 'sun-behaviour' leading to a reduced but sufficient exposure to solar UV radiation later in life (Breitbart *et al*., 2006; Cruz *et al*., 2005; McWhirter *et al.,* 2000). It was also reported that sun-safety behaviour changed more difficultly among preadolescents, adolescents, and college students (Buller *et al.,* 2006; Eide *et al.,* 2005; Reynolds *et al*., 1996; Buller *et al*., 1996). These findings suggested that successful prevention should start as early in childhood as possible.

During the last two years, the Sun-safety project for preschool children has been successfully diffused around Slovenia, too (IPH, 2007). It has started in 2007 as a pilot phase, including ten groups of children, i.e. 240 children between ages 4 and 6 from the Celje region. In four weeks, daily learning activities about the sun-safety were conducted and didactic materials evaluated. The project was extended in the following years, including children (more than 14.000 from 109 kindergartens in 2008, and many more in 2009), their teachers, and parents. It was presumed, that in addition to the informative project, faculties of higher education can play a substantial role in developing a formal and a comprehensive education approach, especially for students of Preschool Education that will once teach and take care of children.

This paper describes the attempt to introduce advanced curricula on sun-safety measures to actual students of Preschool Education Program of the University of Primorska, i.e. future preschool teachers. To evaluate their habits, attitudes and knowledge, and to assess their needs regarding sun protection measures, a group of students was enrolled in the cross-sectional survey using a brief, ad-hoc developed questionnaire. Firstly, students completed the questionnaire and afterwards they underwent several education sessions, and practical training regarding the sun-safety issue. After completion of education, a similar questionnaire was submitted to them. Potential improvement in their knowledge based on comparison of the results of pre- and post-education intervention was then estimated. The aim of this survey was to test ad-hoc developed curricula and didactic materials and their influence on students' compliance with and competence in teaching sun protection to children.

2. Material and methods

Eighty seven students participated in pre-education survey, fourteen (16 %) male and seventy three (84 %) female, of average age 20.6 and 20.3 years, respectively. A brief pre-education questionnaire that consisted of eight questions, listed in Table 1, was developed for this purpose. Students responded to the questionnaire first and were then submitted to education activities. After completion of the education intervention they responded to a post-education questionnaire, with the first three questions omitted.

Table 1. Questions from 'Sun-safety' questionnaire for students

	Question
1.	Where would you prefer to spend a very hot, sunny summer day?
2.	Specify, whether you use any sunscreen: *a) never b) rarely c) sometimes d) regularly*.
3.	Did you lately (last) summer get any sun-burns?
4.	What in your opinion is the 'shadow rule', what does it stand for?
5.	What in your opinion is the main health benefit of the sun to humans?
6.	What in your opinion is the greatest health risk of overexposure to the sun?
7.	Explain the meaning of the UV-index numbers, what do they stand for?
8.	Explain what are the main causes for elevated solar UV radiation?

Afterwards, students that completed all education activities (68%) were included into a post-education survey. Among them there were nine male students (15%) and fifty female students (85%). The comparison of these 59

students' responses is shown in Figure 2, representing the impact of performed education activities and practical training.

Education intervention consist of four lectures regarding causes of elevated solar UV radiation; the types of the UV rays and their characteristics; a *measure* of the intensity of UV radiation reaching the surface of the earth at a given point and given time, i.e. UV-index; types of sunscreen and the role of the sun block factor, i.e. SPF (sun protection factor); and of the benefits, and adverse health effects of UV rays. A special lecture was performed by a dermatologist concerning late consequences of excessive sunbath, like skin cancer and eye cataract. In addition, a post-workshop was conducted to practice the use of didactic materials developed within the Sun-safety project (IPH, 2007) and to model additional ones, like making a paper hat, a play named 'Draw a shadow' and a 'Sun-safety coloring book for children'.

3. Results and Discussion

Students' habits and attitudes

Students' responses from pre-education activities concerning their habits and attitudes are shown in Figure 1. It can be observed from Figure 1, that 80% of male and 31% of female *never, rarely or sometimes* use a sunscreen. Similar proportion of male reported they would prefer to spend a very hot, sunny summer day on the beach in comparison with 65 % of female. It can be assumed, that male apparently used sunscreen less often, they spent more time on the beach, and consequently, they experienced sunburns more often then female, 60 % versus 27 %, respectively.

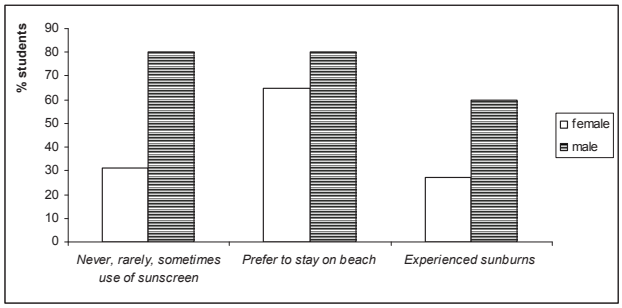

Figure 1. Students' habits and attitudes

Comparison of responses in the post-education survey of 59 students that completed all education activities is shown in Figure 2, representing the impact of education activities and practical training performed. Statistically significant improvement (n=59, $p<0.02$) was achieved for all pre-selected variables, discussed bellow.

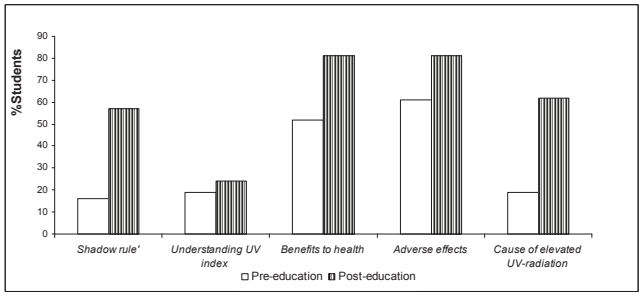

Figure 2. Comparison of students' responses from pre- and post-education activities, n=59

'Shadow rule'

In the pre-education questionnaire, 16% of students explained appropriately the meaning of the 'shadow rule' in comparison with 57% of students in post-education questionnaire; an improvement of 41% can thus be assumed**.** Education material consisted of a play for children ('Draw a shadow'), so it was expected they would be able to explain how to observe their own shadow, or someone else's shadow, or a tree shadow, assessing the time course of the day, when sun protection was necessary. Despite the fact that it was explicitly emphasized that the 'shadow rule' was a simple method for sun protection that *indirectly determines the sun's altitude by observing the length of a person's shadow* during the time course of a day, some students apparently did not acquired sufficient understanding. They gave insufficient or inadequate responses like: *we need to go in the shadow between 10 am and 14 pm*, etc. However, with proper support and further activities this is expected to improve.

UV-index number

Before education intervention, 19% of students adequately described the meaning of UV-index. After completion of education activities this proportion rose to 26%. The expected adequate answer, that UV-index are numbers linearly related to the *intensity of UV radiation* reaching the surface of the earth at a given point and time, or that the UV index was an *open-ended linear scale*, with *higher values representing the risk* level of skin damage due to UV exposure, was rarely given. Students apparently did not learn the common difference between two concepts, the UV-index and Sun Protection Factor (SPF) and a negligible improvement of 5% was estimated. It was assumed that this was due to lack of time for practical training, like modeling of a color UV-index Table to further elaborate this subject. Future work and completion of practical use of UV-index might be useful for this purpose.

Health benefits and adverse effects of UV exposure

More than half of respondents were aware about the health benefits (52 %) and adverse health effects (61 %) of the UV-radiation before education activities, and an even higher level of improvement was achieved with interventions regarding benefits and adverse health effects of UV exposure, *i.e*. 29 and 20 %, respectively. Adequate answers taken into account considered Vitamin D synthesis (a benefit) and skin cancer risk (an adverse effect – the most severe late consequence). The same criterion, i.e., whether these two effects were mentioned at all, was used to evaluate education intervention. Inadequate answers that appeared regarding benefits were like: *good for skin, good feeling, positive to health*, etc.

Causes of elevated UV-radiation

Students were not able to explain the causes of elevated UV radiation in larger proportion than 19%, however, significant improvement was observed after education intervention, i.e. a 43 % improvement. The majority of answers sufficiently and precisely described the point, like*: emissions of ozone depletion substances into atmosphere and consequent depletion of the stratosphere ozone having less potential in absorbance of solar UV radiation*. In comparison, inadequate or insufficient answers were like: *air pollution, emission of gases, ozone hole, etc.* that still persisted in 48 % of cases. Their scarce knowledge regarding ozone depletion and its causes, and consequences before education intervention was a bit surprising, because this subject was expected to be well recognized among general population, at least due to discussion in media almost on daily basis. It should be also mentioned, that this issue was introduced into elementary and middle school curricula as the subject Environment Education. Apparently, students were not much influenced or were not a part of this kind of education background. In our opinion, an advanced (future) teacher should be aware about this task, thus, the introduction of these contents would be useful as well.

4. Conclusions

Students of Preschool Education Program that received education activities regarding sun protection measures showed statistically significant improvement in knowledge about skin cancer prevention. The education was more effective when supported with training to deepen their perception and understanding. Future preschool teachers can

play a substantial role in protecting children from overexposure to solar radiation, thereby reducing their risk for skin cancer. In addition, the education intervention was assumed as being important for the protection of students' health as well, since at this age they are still at high risk for UV exposure that may result in development of skin cancer later in their life.

Self-reported preventive behavior by students and the survey of their awareness and knowledge may lack validity, however, this paper suggests that sun-safety educational curricula need to be implemented in the field of formal education as a good general strategy and sun-prevention measures. Students may be ready for more advanced lectures and contents, than those performed. Faculties of Education in partnership with health professionals, local or national agencies, and policy makers, can further develop and evaluate the materials needed.

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